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WATER QUALITY MEMORANDUM

Utah Coal Regulatory Program

September 27, 2010

TO: Internal File

THRU: Jim Smith, Permit Supervisor JJS 30 Sept 2010

FROM: Steve Christensen, Environmental Scientist SJC

RE: 2010 First Quarter Water Monitoring, Genwal Resources, Inc., Crandall Canyon Mine, Permit & Tracking #3473

Water monitoring requirements for the Crandall Canyon Mine can be found in Sections 7.31.21, *Ground Water Monitoring Plan* and 7.31.22, *Surface Water Monitoring Plan.* Additional information can be found in Tables 7-4, 7-5, 7-8, 7-9 and 7-10.

Water encountered during mining operations was pumped to the portals and discharged to Crandall Creek under UPDES Permit No. UTU0024368. Discharges to Crandall Creek were within the limitations established by the permit with rare exceptions. Prior to 2008 the only sample containing iron at greater than 1 mg/L was on July 26, 2004, when iron was 1.08 mg/L.

Following the mine collapse in August 2007, the pumps were removed from the mine and discharge ceased temporarily. From September 2007 through December 2007 water pooled within the mine, flooding the underground workings. In January 2008 the mine began discharging by gravity flow and has been discharging continuously since. The temporary seals placed in the portals following the collapse required modification for the mine water discharge. Iron concentrations in the mine water discharge occasionally exceeded 1 mg/L from January to November 2008; and have been greater than 1 mg/L continuously since December 2008. Construction of a mine water treatment system began in December 2009 and approved by the Division in January of 2010.

1. Was data submitted for all of the MRP required sites? YES ☐ NO ☒

Springs

The approved MRP requires the monitoring of 24 springs each quarter. Of these 24 springs, 9 require laboratory water quality analysis (See Table 7-4). The remaining 15 springs require quarterly monitoring of field parameters (flow, pH, specific conductance and

temperature).

Of the required 24 spring monitoring sites, only two were accessible due to snow and ice conditions (Little Bear Spring and SP-36).

Streams

The approved MRP requires the monitoring of 12 surface water/stream sites. Of these 12 surface water/stream sites, 9 require laboratory water quality analysis (See Table 7-8). The remaining 3 sites require quarterly monitoring of field parameters (flow, pH, specific conductance, temperature and dissolved oxygen).

Data was submitted for all stream monitoring sites.

Wells

The approved MRP outlines monitoring of 7 wells. According to Table 7-4, all 7 wells required quarterly laboratory water quality analysis. However, due to the mine disaster on August 6th, 2007, the active mine-workings have been temporarily sealed off thus rendering the wells inaccessible.

UPDES

The UPDES Permit/MRP (UT000024368) requires monthly monitoring of 2 outfalls: 001 and 002. Outfall 001 is associated with the discharge from the primary sediment pond at the main mine facility. Outfall 002 is associated with the mine-water discharge that reports directly to Crandall Creek.

The Permittee submitted data for Outfall 002. Outfall 001 did not report a discharge for this quarter.

Pre-Treatment Mine Water Discharge

As part of the permitting process for the mine-water treatment system (Task ID #3461, approved January 27th, 2010), the Permittee has committed to monthly sampling of the pre-treatment mine water discharge for the following parameters:

- *Iron (total, dissolved and ferrous)*
- *Manganese (total and dissolved)*
- *Aluminum (total and dissolved)*
- *Alkalinity*

- *Sulfate*
- *pH*
- *Dissolved Oxygen*

Monthly data was collected for the pre-treatment mine water discharge.

2. Were all required parameters reported for each site? YES ☒ NO ☐

Springs

Little Bear Spring and Spring SP-36 were accessible this quarter due to snow and ice. All of the required parameters were submitted for these springs.

Streams

Of the 5 stream water monitoring sites that were sampled (BCF, Horse Canyon, LOF-1, Section 4 Creek and UPF-1), all of the required parameters were reported.

Wells

NA- Since the mine collapse in August of 2007, the monitoring wells are inaccessible.

UPDES

Outfall 001 did not report a discharge for this quarter. Outfall 002 was sampled each month of the quarter as required by the UPDES discharge permit.

As part of the approval for the mine-water treatment system (Task ID #3461), the Permittee committed to obtain additional monthly samples for Outfall 002. The parameters include (D-Fe, FE2+, T-Mn, D-Mn, T-Al, D-Al, Alkalinity and Sulfate).

All required parameters were submitted for the UPDES outfalls.

Pre-Treatment Mine Water Discharge

As discussed above, monthly sampling of the Pre-Treatment Mine Water Discharge became a requirement with the approval of the mine-water discharge treatment system. All of the required parameters were submitted for the pre-treatment mine water discharge.

3. Were any irregularities found in the data? YES ☒ NO ☐

Springs

Due to access issues, only spring monitoring sites SP-36 and Little Bear Spring were sampled. No irregularities were reported for this quarter.

Spring monitoring site SP-36 reported an elevated D-Ca concentration the previous quarter. The reported D-Ca concentration went from 70.92 ppm the previous quarter to 64.48 ppm this quarter. This quarter's reported value is within two standard deviations from the mean.

Site SP-58 had reported several parameters outside of two standard deviations the previous quarter (SO4 for the second consecutive quarter, TDS for the third consecutive quarter as well as D-Ca and Total Hardness). Due to the inaccessibility of the site, it could not be sampled this quarter. Continued monitoring will be conducted once the site is again accessible and data collected.

Site SP-79 reported an elevated D-Ca concentration the previous quarter. Due to the inaccessibility of the site, it could not be sampled this quarter. Continued monitoring will be conducted once the site is again accessible and data collected.

Site SP 1-33 reported a second consecutive elevated SO4 concentration the previous quarter. Due to the inaccessibility of the site, it could not be sampled this quarter. Continued monitoring will be conducted once the site is again accessible and data collected.

Streams

As the total iron (T-Fe) concentrations in the mine-water discharge have increased, a similar rise has been observed in stream monitoring site LOF-1 (lower Crandall Canyon flume). An upward trend of T-Fe began to surface the second quarter of 2008. There have been fluctuations, but the overall trend has been upward. Last quarter's reported T-Fe value at LOF-1 was 1.479 mg/L. However, this quarter's reported value was 0.503 mg/L. Continued monitoring will be conducted in order to ascertain a relationship between the T-Fe concentrations in the mine-water discharge and the receiving stream.

The Section 4 Creek monitoring site reported an elevated dissolved calcium (D-Ca) value the previous quarter. The reported D-Ca value was back to within two standard deviations of the data set this quarter. Continued monitoring will be conducted.

Shingle Creek reported an elevated conductivity value the previous quarter. However, the site was inaccessible this quarter. Once the site is accessible and sampled, continued monitoring will be conducted to determine any trends that may be developing relative to conductivity values.

UPF-1 (Upper Flume Crandall Creek) reported elevated SO4, Total Hardness and TDS the previous quarter. All three parameters reported markedly lower concentrations that were within two standard deviations from the mean. Continued monitoring will be conducted to evaluate potential trends.

UPDES Sites (001 and 002)

Outfall 001 reported no observable flow for the quarter.

Outfall 002 reported an average flow of 428.3 gpm for the quarter. T-Fe concentrations continue to remain elevated. All three sampling events conducted this quarter produced T-Fe levels above the UPDES limit of 1.0 ppm (3.2 ppm, 3.3 ppm and 3.23 ppm respectively for January, February and March).

The Permittee has completed construction of the mine-water discharge treatment system. Final approval for the treatment system was granted by the Division on January 27th, 2010. The mine-water treatment system utilizes a Maelstrom oxidizer unit, a coagulant and flocculent injection system and settling basin.

A field inspection of the Crandall Creek drainage will be performed with all other regulatory authorities once access allows. The purpose of the field inspection will be to explore what (if anything) can be done to minimize/mitigate the amount of iron staining within the channel. The orange, oxidation staining within the drainage was initially observed in July of 2009.

4. On what date does the MRP require a five-year re-sampling of baseline water data.

Page 7-33 of the MRP states that groundwater samples collected during the low flow period (typically the 4th quarter) every 5 years will be analyzed for baseline parameters (See Tables 7-5). The 4th quarter of 2010 will be the next sampling event where baseline data will be required.

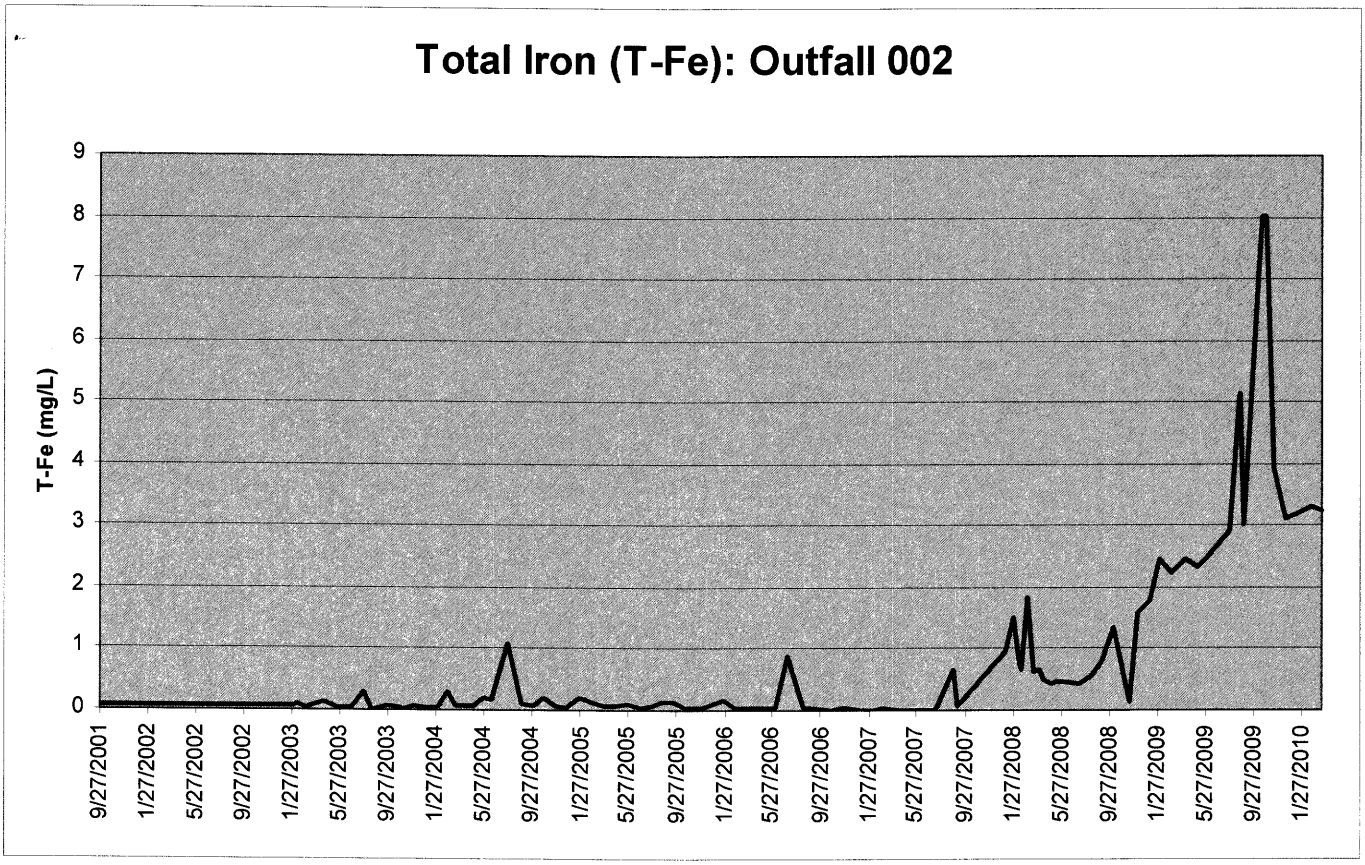
Page 7-35 of the MRP states that surface water samples collected during the low flow period every 5 years will be analyzed for baseline parameters (See Table 7-9). The 4th quarter of 2010 will be the next sampling event where baseline data will be required.

5. Based on your review, what further actions, if any, do you recommend?

Continued data collection and monitoring of the mine-water discharge will be necessary to evaluate the effectiveness of the mine-water treatment system. Monitoring of the pre-treatment mine-water will help determine the overall chemistry of the raw mine-water.

Continue to monitor elevated water quality concentrations for sites that were inaccessible this quarter.

Work with other regulatory agencies in determining what if anything can be done to remove or mitigate the iron staining within the Crandall Creek stream channel (See Photos Below).


Total Iron (T-Fe): Outfall 002
T-Fe (mg/L)
0
1
2
3
4
5
6
7
8
9
9/27/2001
1/27/2002
5/27/2002
9/27/2002
1/27/2003
5/27/2003
9/27/2003
1/27/2004
5/27/2004
9/27/2004
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5/27/2008
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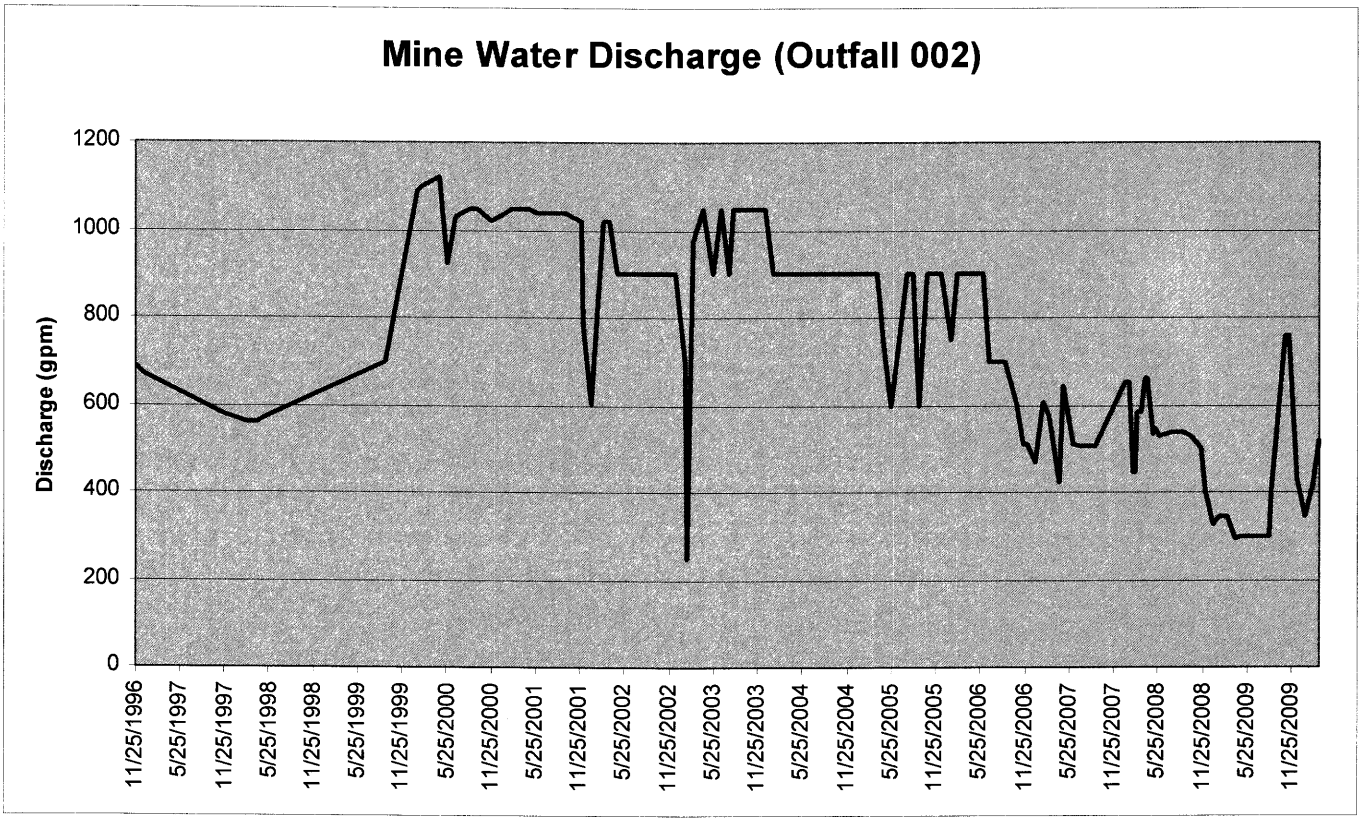
1/27/2009
5/27/2009
9/27/2009
1/27/2010


Mine Water Discharge (Outfall 002)
Discharge (gpm)
0
200
400
600
800
1000
1200
11/25/1996
5/25/1997
11/25/1997
5/25/1998
11/25/1998
5/25/1999
11/25/1999
5/25/2000
11/25/2000
5/25/2001
11/25/2001
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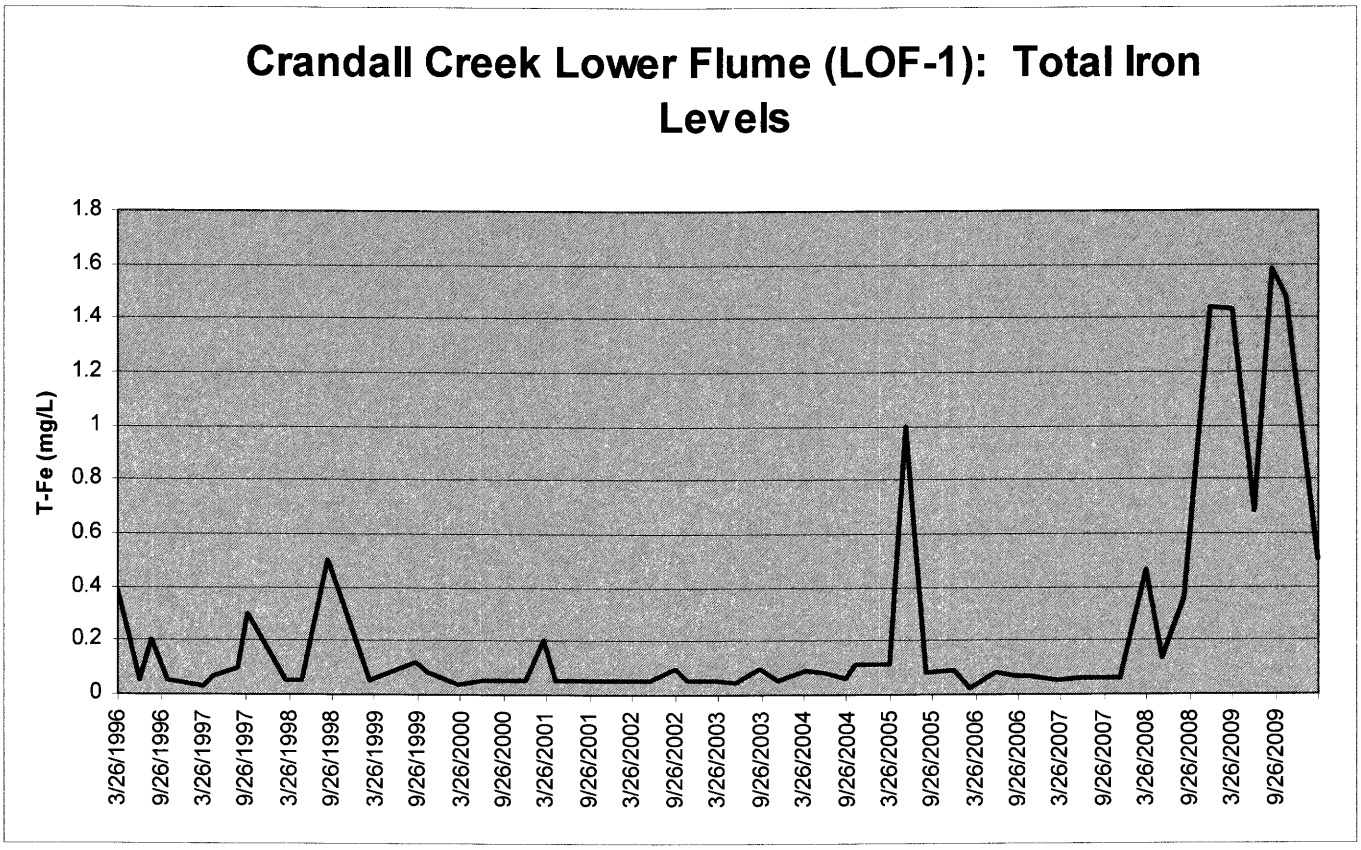
5/25/2009
11/25/2009


Crandall Creek Lower Flume (LOF-1): Total Iron Levels
T-Fe (mg/L)
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
3/26/1996
9/26/1996
3/26/1997
9/26/1997
3/26/1998
9/26/1998
3/26/1999
9/26/1999
3/26/2000
9/26/2000
3/26/2001
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3/26/2008
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9/26/2009